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22 April 1965

Ervin M. Wilson, 651 Huntley, Los Angeles Cal. 90069

Greetings---

I am started on the translation of the important (at least, what I suppose to be important) passages in that Arabic music treatise. I believe that Soviet publications have to be ordered through some kind of an agency. It used to be the one called Amkniga in New York City, and then called Bookniga--I don't know what it is called now. (Kniga is the Russian word for book.) Besides this, there used to be a listing in the Saturday Review of Literature of one or more New York firms that imported Russian books.

The portion you loaned to me is the Commentaries (originally in Russian) on the Treatise (originally in Persian). It is possible that the treatise in Persian has been translated into something more accessible than Russian--say French or German.

I am taking the liberty of writing in on the copy the transliterations of those Arabic names, and fortunately the French tables you sent me have these names also, or some of them. There is no Q and no W in the Russian alphabet.

I found a misspelled Greek word in the Commentary.

The last several days have been spent writing innumerable postcards and letters to take advantage of the publicity of the Numaudo code. I chased all over town to try to locate a copy of Product Engineering (of course I read the one in the library, but people are so ~~xx~~ damned skeptical about me that I had to have my own copy of the magazine right here to prove that it had appeared in print) and ironically, after squandering \$1 in bus fares, the magazine turned up at a little dinky back-number store about $\frac{1}{2}$ mile from here where I take things to the self-service laundry (washing my dirty linen in public!).

I need several photocopies and so will have to inquire until I find somebody who can borrow a copy of Product Engineering for April 12 and copy that page (5).

Yesterday I saw in the current TIME (p. 80, April 23) a futuristic item about voice-controlled machinery for astronauts, so I wrote Time magazine about my code appearing in Prod. Engg. and ~~Time~~ while I don't have much chance of breaking into Time, maybe if I keep trying every time they publish something relevant, who knows?

I got a letter yesterday enclosing \$5 for a set of my publications and telling me that this man and his two teen-age sons had listened to the Numaudo tape and thought it was workable. They had not heard yet of the Product Engineering article. He had ordered the Numaudo book about a year ago when told about it by somebody in the New York City general semantics group.

Last Sunday's L.A. Times carried a triple-barrelled article — three interviews on Computers and the Humanities. Albert Goldberg interviewed Gerald Strang on Computers and Music, so I wrote both of them.

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PAGE 2 # EMW ### 22 & 24 April 1965

Another order for the Numaudo book, this time from the Veeder-Root Co.--they are people who count---they make practically all the Counting machines on other machinery.

Talbot Winchell of the semantic group phoned me and said he was ordering 10 copies of that Product Engineering thing to sell at the General Semantic Meeting in two weeks. He has a Book Table, and since he was ordering other books and things from McGraw-Hill, he will add these to the order.

I was translating the Russian text under the same conditions that I copy out of books, and had to quit doing it that way and put the original over where I wouldn't see it while typing. I got kind of seasick trying to type the Russian words instead of translating them! Weirdest feeling imaginable!

Enclosed up to page 6--I omitted some excess verbiage, and I suppose to make this process feasible I will have to omit other things farther along, but by putting my page numbers in a light pencil (so it won't re-photograph if you have to copy your Xerox again) you will be able to tell how much I will be leaving out. There is considerable repetition and some irrelevancies.

Unfortunately there are some Russian words of multiple meaning--LAD can mean fret or tuning or scale or adjustment or all-right-ness or the state of being in good order.

лад

I guess I finally built a hot enough fire under the "late" Robert Spring and he mailed the list of names he promised me a year and four months ago! He also enclosed enough to pay the postage for sending out all the stuff I am supposed to send them. I don't know whether I told you about it at the time: on December 26, 1963 he called me and said he was bringing a friend of his along to see the organ unit and hear my In Limbo tape---and he showed up at the door an hour late with NINE of his friends and the crowding and confusion was such that I never got any of their names. So in a phone call a week or so afterward he promised to send me this list and never did.

When you were coming here the last time I forgot to remind you about that Etude. Better not try to mail it--just put it someplace you will remember to bring it when you come next time.

I had an unexpected source of amusement the other day, that you might try some time: I went through a couple of stores that were selling toy pianos and golly! the scales these were actually tuned to! somebody has a tiny ear. So not all children are being brought up according to 12-tone orthodoxy!

Yours,



ENCL

1 - 6

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Ivor Darreg 1280 Exposition Boulevard, Los Angeles, California 90007
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Thursday morning 3 June 1965

Ervin M. Wilson, 651 Huntley Drive, Los Angeles, Cal. 90069

Greetings---

I decided just now it wasn't fair for me to hold up the completed translation pages (7-8-9-10-11-12) till I could fix up the diagrams belonging to them. I will do those in a couple of days and send them when I have completed two more pages. Beyond about p. 90 or so of the original, I will have to do ~~without~~ without the musical examples, or I shall never get done. We ought to be able to figure ~~out~~ out a paste-up method. Meanwhile I will letter in transliterations on the original.

They woke us up at 5:40 this morning (and that's really an hour earlier with Daylight time!) with a pavement smashing machine and whistles blowing and bulldozers grinding away. The noise is dreadful. The place where the track crosses Normanide is the current target. I nearly sprained both ankles crossing back and forth to the store and the mailbox.

A postcard just came from Prof. Fokker, giving his ratio interpretation of my Augmented Seventh deal in Excursion Into the Inharmonic. So I will copy this off for you and enclose it. He also received my Exposé #33 and read my Partch review.

Trip to the library yesterday didn't do much good. Only thing that might interest you was that I consulted the French music dictionary (3 volumes) again and this time looked up their spellings of the Arabic terms. So there will be oodles of Q's in this MS. Especially maqam.

Don't know whether I told you: the Russians shy away from the Arabic word for lute ('ud) and are very careful about that apostrophe or inverted comma (It's really a Greek reversed apostrophe, an aspiration sign, but in Arabic it means the glottal stop and is a letter of the alphabet in full right)--because the Russian word ud can mean penis, among other things.

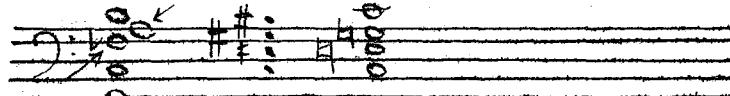
Russian is like Spanish in not having apostrophes--they are exotic curiosities.

Ed Kneifel stopped by unexpectedly when I was washing dishes and all was confusion. He had to take the Cage catalog back to Peter Hewitt at the College. He brought me a photocopy of Der Spiegel, the German magazine something like Newsweek--article about a computer drawing abstractions and other "artificial art"--and then turning critic and comparing Rembrandt against Rubens!

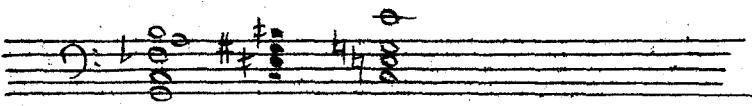
So now you have diagrams presenting a 41 Just system. I can see that it will be much easier to tune the exact ratios than to set the 41-tone temperament. However, the behavior of my organ suggests that some crackerjack electronic engineer could design a self-setting 41T equal system--a circle of fifths which would "slip" here and there. I suppose 41 would have to be tuned by the major and minor thirds' beats, since the fifths are so nearly perfect. And how about an unequal system? I mean a compromise

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A. Fokker, some ratio-number interpretations of Excur. Enharm. I.D.



10 - 60	$\frac{63}{6}$	$\frac{64}{6}$
9 - 54	$\frac{50}{5}$	$\frac{48}{5}$
7 - 42	$\frac{41}{7}$	$\frac{40}{7}$
4 - 24	$\frac{32}{4}$	$\frac{32}{4}$



105/2	$\frac{54}{5}$	$\frac{56}{5}$
189/4	$\frac{44}{4}$	$\frac{42}{4}$
147/4	$\frac{36}{4}$	$\frac{35}{4}$
28	$\frac{28}{4}$	$\frac{28}{4}$
21	$\frac{16}{3}$	$\frac{14}{3}$

"One is concerned with
 chords halfway the
 outer ones."



56	$\frac{57}{5}$	$\frac{60}{5}$
50	$\frac{48}{5}$	$\frac{45}{5}$
40	$\frac{39}{5}$	$\frac{75}{2}$
30	$\frac{30}{5}$	$\frac{30}{5}$
20	$\frac{18}{5}$	$\frac{15}{5}$

"Two a's with a comma difference!"

ACADEMY OF SCIENCES OF THE UZBEK SOCIALIST SOVIET REPUBLIC

Institute of Aesthetics

ABDURAKHMAN DJAMI

TREATISE
ON
MUSIC

Translation from the Persian
by A. N. Boldyrev

Editing and Commentary
by V. M. Belyayev

Publishing House of the Academy of Sciences of the Uzbek SSR

Tashkent, 1960

V. M. BELYAYEV

COMMENTARY TO THE
"TREATISE ON MUSIC"
BY
ABDURAKHMAN DJAMI

[Note: This Commentary was originally in Russian. Translation into English by Ivor Darreg.]

#

Before entering upon the main theme of our work,--that is, to the Commentary, we must make some remarks concerning the translation from Persian into Russian of Djami's treatise.

The terms relating to the nomenclature of the pitches obtainable on the lute, and the notions makam, avaze and shu'be are retained. This should ease the tasks of musicologists who are studying the problems of Arabic and Persian music. Arabic letters used by Djami are retained, with explanations sometimes appended within square brackets.

In the ninth section and other parts of the text there are lacunae, and the emendations supplied by the editor have been enclosed in square brackets accompanied by two dots, thus:

For the designation of the notes of the seventeen-tone scale the translator has taken the enumeration of Safi ad-Din, as given in the work of J. Rokanet, "La musique arabe", A. Lavignac's "Encyclopedie de la musique" and in the transcriptions in Book III of R. Erlanger's "La musique arabe", and Safi-ad-Din's "Kitab al-adwar" and "Ash-Shara-Fayya". Concerning this one should note that Djami, as well as Ash-Shirazi (1236-1316) in his musical treatise "Durr at-tadj", of which the MS. is kept in the library of the Institute of Eastern Studies of the Uzbek SSR Academy of Sciences in Tashkent, deviate from the system of Safi-ad-Din, changing in places the Arabic letters djim ζ and dal $\dot{\zeta}$ and giving only careless attention to the interval of the Fifth diminished by one (pythagorean) comma (678 cents), not noting occasional mistakes, imperfectly-written letters and lacunae. Besides that, in the translation of Djami's Treatise on Music, the numeration of the sections (fassle's) not supplied by Djami, but usual in his time, has been included.

A. N. Boldyrev has performed the translation by means of a photocopy from the MS. of the kulliyat (complete collection of the works) of Djami, kept in the Institute of Eastern Studies of the Uzbek SSR Academy of Sciences, in Tashkent and dated 1502. This MS appears to be a fair copy of the author's work, with the exception of small mistakes.

With that short introduction we may go through the commentary to the "Treatise on Music" section by section:

INTRODUCTION. Section 1. This begins with the "Hymns in praise of the Lord" and "songs in greeting to the prophet Mohammed" with comments by Djami as an authority on the religion of his time, and as a Sufi poet. For Djami music must have only a religious significance, as a means of drawing man closer to God and the perfection of his desire. This is expressed by the inclusion of poetic passages. ... This was considered necessary by this religiously-oriented author, living at the time he did, and the word "amen" is used in the translation to represent these passages. ...

The style of this section is flowery and literary, characteristic of the epoch and connected, in view of the musical content of the Treatise, with a play on musical terms, sometimes given in the translation and sometimes not. For example, the term "tan" means "body" and also ... means a certain rhythmic figure.

The citing by Djami as the reason for composing the treatise, that a friend had requested it, is analogous to Descartes' similar reason for writing his tract "Compendium musicae", which is not generally included in the corpus of Descartes' greater works.

Section 2. This begins with a brief account of the origin of music. Here Djami abandons the field of religion and proceeds in more scientific manner. The development of sound and voiced speech, he links with the development of the individual as a functional member of collective humanity, emphasizing the social roots of the origin of human speech, and thereby the development of a musical art. Sound as a means of communication among people, from the very beginning of human existence, Djami relates to the particular importance of musical art in the mental development of human affairs. However, he treats this in accordance with Sufi doctrine, in connection with the attainment of ecstasy, thus straying into Sufi mysticism.

Of special interest farther on in this section is the effort of Djami to link the compositional units of musical production with the concept of melodic line in homophonic song.

This section concludes with a very important observation concerning the capability of music to ... arouse in its ... hearers the emotions of joy or sorrow, disappointment or hope, falling or rising spirits "giving the sound its definite form, painting it in a definite color", i.e. pointing out the intimate connection between music and the experiences of a person, and revealing the deep psychological significance of this art.

Section 3. Here very briefly are given definitions of the term "music" as the science of building "perfected beauty" and two aspects of this science: tones and the so-called teaching about composition, and duration and the so-called teaching about rhythm.

Section 4. TEACHINGS ABOUT COMPOSITION. This section is dedicated to the distinction of the melodic musical tone on the one hand, from purely rhythmic sounds, such as produced by percussion instruments, and on the other hand, from mere noises. The author calls tone a "phenomenon of art" rather than a "phenomenon of Nature".

Section 5. In this section is defined the concept of Interval as the successiveness [consequence?? ed.] of two tones, then of the tetrachord and the pentachord, being united in the one idea called djins, then comes the djam as the union of two djins'es and finally, melody as the conjunction of tones united with one another ~~xx~~ and ordered by duration and rhythm. Then is shown the method of defining relations among tones with the help of stringed instruments, giving special attention to the measurements of string lengths.

Section 6. This contains a general review of the concept of the gamut of seventeen tones (Footnote: in the sense "collection of tones" rather than as defining the tuning of these tones.) in professional music, and the possibility of realizing these seventeen tones in various octaves.

Section 7. In this very important division is explained the formation of the seventeen-tone system as a scale, formed as a result of the defining of scale intervals through the Pythagorean system, through relations of Fifths, Fourths, and Seconds (this latter the difference between Fifth and Fourth) leading to the relations between the scale-degrees. Djami gives the following ordering of tuning of the 17- degrees, beginning with its initial tone, appearing as the tone of the open string. Here are the intervals in cents (hundredths of the tempered semitone) beginning with the small (tenor) octave.

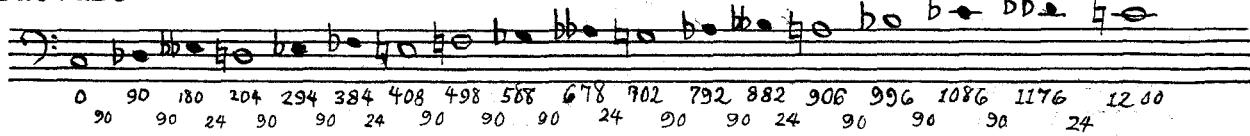
1)	c	0
2)	c'	1200
3)	g	702
4)	f	498
5)	d	204
6)	a	(204 + 702)
7)	e	(906 - 498)
8)	e flat	(498 - 204)
9)	d flat	90 (294 - 204)
10)	a flat	(90 + 702)
11)	g flat	(588 + 498)
12)	c' flat	(1086 + 498)
13)	f flat	(1086 - 702)
14)	e doubleflat	(384 - 204)
15)	a doubleflat	(180 + 498)
16)	b doubleflat	(180 + 702)
17)	d'doubleflat	(678 + 498)

The interval of the octave (1200) is produced by the division of the string into halves, the interval of the Fifth (702) by the division of the string by 2/3, of the Fourth (498) by the division by 3/4 and the large whole-tone (204) by the division of the string by 8/9. The remaining intervals are formed by the initial intervals by way of Fifths, Fourths, and Seconds. We append this table in the form of staff-notation: (page 74 of original).

5 4

0 1200 702 498 204 906 408 294 90 792 588 1086 384 180 678 882 1176

In consequence we get a seventeen-degree scale of the following structure:



which gives five large whole-tones of 204 cents:

c - d, d - e, f - g, g - a, b - c',

with an internal division of each of these into two small semitones of 90 cents and a comma of 24 cents:

$$\begin{array}{ccccccc} 0 & 90 & 180 & & 204 \\ & 90 & \underline{90} & 24 \\ & & 174 & & \end{array}$$

and also two small semitones of 90 cents:

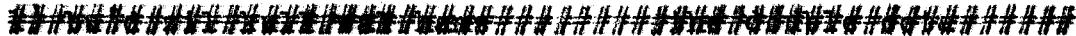
e - f, a - b,

this comprising the diatonic basis of the seventeen-degree scale.

Showing the possibility of forming this scale in the higher registers of the second and third octaves, Djami directs attention to the approximation, but not absolute accuracy, of the realization of the seventeen-tone (or any other) scale on instruments, since the stopping of the fingers on the finger-board of the instrument can never be absolutely accurate.

Section 8. This section contains a short account of the theory of the misl or the system used by the mediaeval Arabian and Iranian musical theorists for the comparison of interval-size and "harmonization" of tones, composing this or that interval, among themselves. This is discussed in the following section.

Section 9. This defines the principal intervals of the 17-tone scale, called "harmonic" by Djami. This means "producing healthy feelings". Djami considers nine such intervals to be of importance:



- 1) bu'd zil kull [twice] ---- The double octave, 2400 cents
- 2) bu'd zil kull wal hams — The twelfth, 1902 cents
- 3) bu'd zil kull wal arba'a—the eleventh, 1698 cents
- 4) bu'd zil kull — The octave, 1200 cents
- 5) bu'd zil hams — Perfect fifth, 702 cents
- 6) bu'd zil arba'a — Perfect fourth, 498 cents

7) tanini	The large whole-tone	204 cents
8) mudjannab	The small whole tone	180 cents
9) bakiye or fazle	The small semitone	90 cents.

From these nine intervals, six intervals, namely the Octave, Fifth, Fourth, large whole-tone, small whole-tone and small semitone, Djami counts as harmonic "in the first harmony", i.e., as harmonic in the first order because of the solidity of their sound; and the remaining three intervals, the double-octave, the Twelfth and Eleventh as harmonious "in the second harmony", i.e., harmonious in the second order because of their similarity to the Octave, Fifth, and Fourth.

Harmonic intervals of the first order Djami divides into three groups. In the first group he includes the interval of the octave as an interval of harmonic "completeness", both tones of which, being taken at once, melt upon hearing into one sound. In the second group he includes the intervals of the Fifth and Fourth, as intervals "not appearing completely harmonious", i.e., consonant upon the simultaneous sounding of their tones, but not melting together. In the third group he includes the intervals of the large whole-tone, the small whole-tone and the small semitone, as not giving consonance in their simultaneous sounding, but producing a pleasant impression in the sequence of one tone after another--in melodic contexts.

For these intervals Djami gives the following numerical ratios:

For the octave	2:1
For the Fifth	3:2
For the Fourth	4:3
For the large whole-tone	9:8
For the small whole-tone	10:9
For the small semitone	16:15 [sic!]

From these ratios, 2:1, 3:2, 4:3, and 9:8 appear the exact relations of the pythagorean system, on the basis of which is formed the tone-collection of the 17-tone scale of Djami. Concerning the ratio 10:9, giving an interval of 182 cents, and 16:15, giving an interval of 112 cents, they seem neighboring and approximate. The exact numerical Pythagorean relations for these intervals are the following: for the small whole-tone of 180 cents 59049:65536, and for the small semitone of 90 cents, 243:256.

The interval of an octave of these nine principal intervals defines the "diapason" of the djam's --- the basis of fretting. The interval of the Fifth defines the (compass?) of one of the djins's--the pentachord; the interval of the Fourth defines the compass of the other djins--the tetrachord. All these three intervals, besides that, give reference points for the development of melodic movement.

Similar reference points for melodic movement in the second or upper octave are given by the Eleventh, the Tenth, and the Double Octave. As for the large whole-tone, small whole-tone and small semitone, these three far smaller divisions of the 17-tone scale fitting into the compass of a large whole-tone, appear in the function of filling-in (completing) intervals helping form the Fourth, Fifth, Octave, etc. forming the tonal system of Arabic and Persian music of Djami's period.

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As was shown earlier, in our commentary on Section 7, the division of the large whole-tone into smaller intervals can be accomplished with two small semitones and a comma ($2 \times 90 + 24$ cents).

0	90	180	204
	90	90	24
114			

Djami does not specially call attention either to the comma or to the large semitone, yet these intervals play an important role equal to that of the large and small whole-tones and the small semitone in the tuning-systems of Arabian and Persian music. And although the interval of a comma is smaller than the interval of a small semitone, Djami nevertheless considers bu'd bakiye, that is, the interval of a small semitone, the smallest of all intervals.

In the original MS., the text of this section, from which our translation into Russian has been made, contains a series of lacunae, which we indicate in the translation through the aid of square brackets preceded or followed by two periods...[].

Section 10. This is a short résumé of the preceding section, with an appendix added, containing interesting remarks on the consonance of the octave as the most perfect of all consonances.

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Section 11. In this section are introduced the various aspects of the djins's---pentachords and tetrachords---and the methods of formation of their tunings, their djam's, are shown, by means of uniting a tetrachord with a pentachord. Djami gives each aspect of the tetrachords and pentachords on the corresponding degree of the 17-degree gamut, particularly noting those intervals forming the neighboring degrees. For indicating the interval of a large whole-tone of 204 cents (tanini) he uses, in conformity to received practice, the letter ta b; for the interval of the small whole-tone of 180 cents (mudjannab), the letter djim C, usually represented by only its upper part ,, and for indicating the interval of the small semitone of 90 cents the letter ba ~ is used.

The letters , may indicate either the small whole-tone or the large semitone (180 or 114 cents); the letter ~ may indicate either the small semitone of 90 cents or the comma of 24 cents. This accords with received practice.

Djami gives seven kinds of tetrachords, beginning with the initial tone of the 17-degree gamut. He gives thirty kinds of pentachords. Although Djami introduces these in this section, it would be more convenient for us to treat them in the following section.

Section 12. In this section Djami briefly describes the

principle of formation of the scales or djams, being comprised in the consecutive joining of each of the seven forms of tetrachords with each of the thirteen forms of pentachords, which gives in all 91 distinct scale-formations. As is clear from Section 15 of Djami's "Treatise on Music", where the description of the tuning of each system gives its "numeration" according to the usual scale-forming methods, Djami in the present section had to give as the principal system of tuning a system of only 84 scales, formed by the joining of each of seven tetrachords with each of twelve pentachords; and he had to consider the scales formed by the seven tetrachords with the thirteenth pentachord as a special, separate case. We give both tables with their intervals in cents. [Separate sheet; page 79 of original Russian text.]

Djami follows the "Kitab al-Adwar" of Safi ad-Din (cf. La musique arabe, by R. d'Erlanger, t. III, Paris 1938) as far as the principles of scale-formation are concerned. The exception consists of six groups of supplementary scales, which were derived from the joining of each of the seven tetrachords with six pentachords of new construction.

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Section 13. In this section Djami turns his readers' attention to the impractical nature of many of the 91 scales in the theoretical system, saying that "not every possible conjunction of a djins from the first group with a djins from the second group will give a good feeling, even though each djins, in and for itself, gives a thoroughly pleasant impression." We may add to this, that the formation of the system of 85 scales and the formation of systems with a greater number of scales than that, is undoubtedly the result of theorizing (i.e., of merely enumerating all the possibilities of forming scales).

With regard to the process of scale-formation itself, of scales useful in practical music, this is a creative process, i.e., one coming from creative needs, and not from theoretical juggling of elements. This is the reason why the commonly-used scales of Arabian and Persian music find their places in the system of 84 scales, as can be seen in the 15th section of Djami's Treatise, without implying a definite principle by which they might be selected from the theoretical scales possible.

At the end of this Section, Djami remarks on the particular artistic merits of eight maqams, out of the generally-accepted twelve, but does not give their names. Which eight were they?

Section 14. In this Section, Djami gives a diagram of the fingerboard of the Arabian lute ('ud), the generally-accepted tuning of its strings by fourths, and its complete series of tones as a guide for the further passages in the Treatise, containing descriptions of the interval-tunings for various scale-formations. On page 81 of the original Russian text is given a diagram with the addition of interval-values in cents and the modern interval-designations.

Along with the tuning of the lute by fourths, the principle of the seventeen-degree scale, discussed in Section 7 of the Treatise, we are also informed of two additional tones, which can enlarge the system by their presence: zir and hadd on the two uppermost strings of the lute, giving g-double-flat of 474 cents and c-double-flat of 972 cents, not members of the 17-degree scale.

It is important to note that Djami calls the interval of a minor third, 294 cents, wustai furs, i.e. the Persian middle-finger note; and the interval of the major third diminished by a (pythagorean) comma, 384 cents, wustai zalzal, i.e., the Zalzal middle-finger note. In the beginning the Persian middle finger note was the (just) minor third of 316 cents, arising from the ratio 10:12 or 5:6 and occurring as a result of the division of the interval of a Fourth into three equal parts (principle of equidistant division). As for the Zalzal middle-finger note, its present size, the interval of a neutral third of 355 cents ratio 22:27, is a mean value between the Pythagorean intervals of the Fourth and the small Whole-tone.

The seventeen-degree scale of the kind given by Djami in his Treatise, was formed definitively in the 13th Century through the labors of Safi ad-Din (died 1294), Ash-Shiraz (1236-1310) and Abd al-Qadir (died 1435). Ibn Sina (980-1037) in the Kitab ash-shifa and in Nadjet (see R. d'Erlanger, La musique arabe, III, Paris 1938, pp 241-243, and M. El. Hefny, Ibn Sina's Musiklehre, Berlin 1930) presented the Pythagorean, zalzalian, and equidistant-division systems together. The same is true of Al-Farabi (ca. 870-950). See Al-Kindi, Risala fi hubr ta'lif al-alhan, Leipzig, 1931.

One and another use the 17-degree scale; their predecessor Al Kindi (ca. 790-874) use a series of tones which appears to be the chromatic scale in flats. See A. J. Ellis, Über die Tonleitern verschiedener Völker, Sammelbände für vergleichende Musikwissenschaft, Band I Seite 18, München 1922.

The lute of Al-Kindi was five-stringed. Consequently the remark of Djami that the fifth string of the lute was added by Al-Farabi is inaccurate.

Thus far we have converted the intervals of the seventeen-degree scale into a modern nomenclature of tones based upon the Pythagorean system and its formation. However, for the practical use of this system the Pythagorean notation will be unsatisfactory. Accordingly, in our further discussions we shall use a special orthography for the tones of the seventeen-degree scale, as per the following example:

Below the first staff are the following cent values:

0	90	180	204	294	384	408	498	588	678	702	792	882	906	996	1086	1176	1260
90	90	24	90	90	24	90	90	90	90	24	90	90	24	90	90	90	24

It will be necessary sometimes to deviate from the above scheme when a diatonic tuning of the intervals so demands.

Section 15. In this section, headed "About the Famous Twelve Maqams", Djami gives the tonal series of the twelve principal scales of Arabic-Persian music, using for this the fretting of the lute and giving appropriate diagrams in the text.

[This system is shown on page 83 of the original Russian text. See separate sheet.]

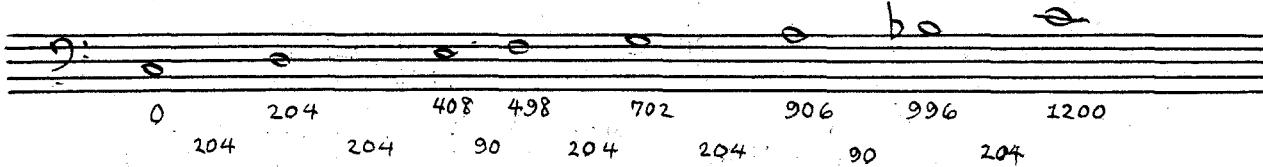
Except for the second form of the Maqam "isfahan", this table corresponds completely with that of Abd al-Qadir. See R. G. Kiesewetter, Die Musik der Araber, Leipzig 1842.

A comparison of the tables of the maqams by Djami and Safi ad-Din shows some differences between them only in two maqams: Hidjaz and Isfahan. Djami's maqam Hidjaz answers to that of Safi ad-Din (union of the fifth tetrachord with the sixth pentachord) but not the Hidjaz of the "ancient" theorists (union of the sixth tetrachord with the sixth pentachord). As for the maqam Isfahan, the first form of this is lacking in Safi ad-Din, while the second form is uniform with the Isfahan of Safi ad-Din.

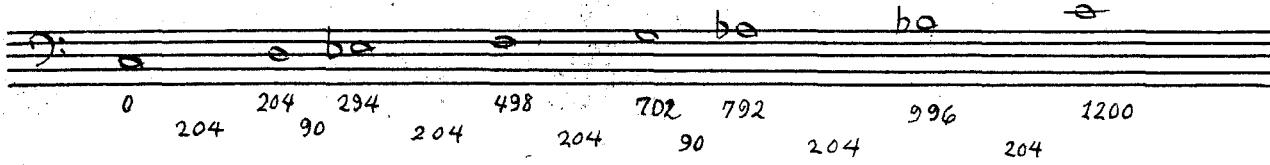
The foregoing only affirms the constant development of scales in Arabian and Persian music, before Djami's time as well as since.

We give below the full system of maqams in the period of Djami, expressed in staff-notation and with interval-size in cents:

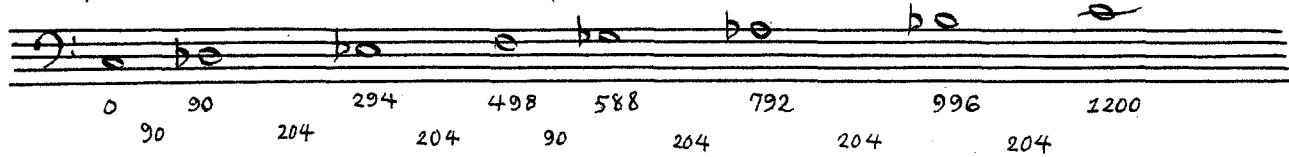
Maqam Ushshak:



Maqam Nawa:



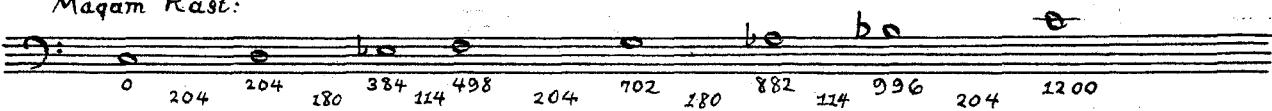
Maqam Busalik:



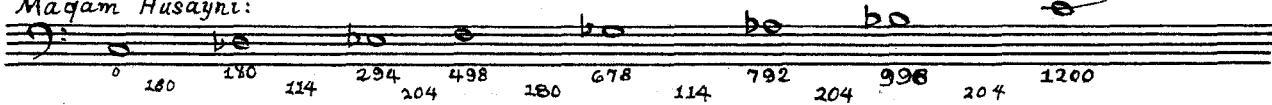
These three maqams (Ushshak, Nawa, Busalik) represent the older scale-forms of Arabian and Persian music in the time of Djami and Safi ad-Din, being formed from intervals of 204 and 90 cents, i.e., from intervals of the diatonic scale, in which these intervals can be found determining the first, second, and third degrees.

Maqam Rast:

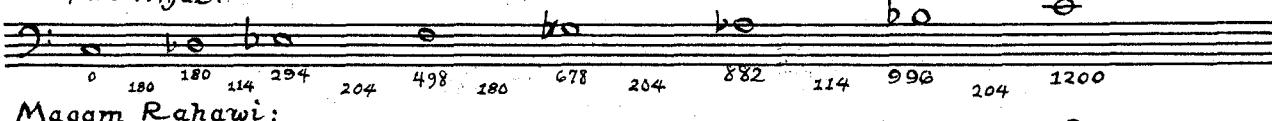
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Maqam Husayni:



Maqam Hijaz:



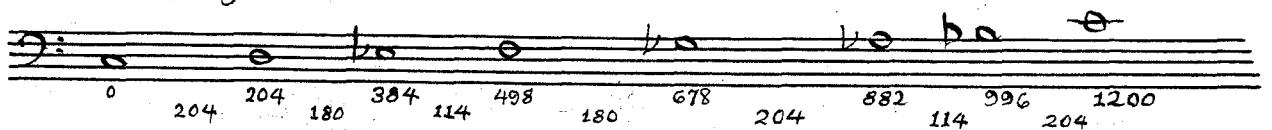
Maqam Rahawi:



This group of maqams, based upon the use of intervals of 204, 180, 114, and 90 cents, is capable of being produced within the flat chromatic scale of twelve degrees, in which Maqam Rast can be begun on the second degree; and the remaining maqams, Husaini, Hidjaz, and Rahawi, from the third degree.

These four maqams represent the second historical stage in the system of twelve maqams.

Maqam Zangule:



This maqam may only arise in the seventeen-degree scale, because of the sequence of two intervals of 180 cents, separated from one another by an interval of 114 cents:

d	e-flat	f	g-flat
204	384	498	678
180	114	180	

which is impossible in the flat chromatic scale.

Maqam Iraq:

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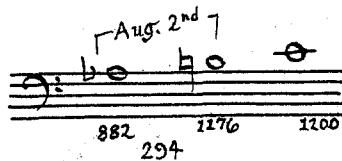


This maqam has two aspects. The first one is without bakiye, i.e. omitting b-natural (1176 cents) and having eight diatonic degrees.

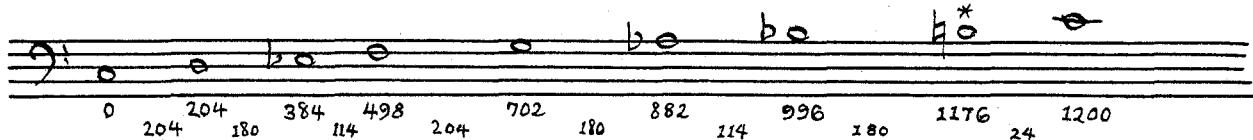
The second aspect has bakiye, containing nine degrees, involving the addition of b-natural, 1176 cents, which added tone may be used in contemporary musical practice as an auxiliary tone to C, being a comma of 24 cents from it:



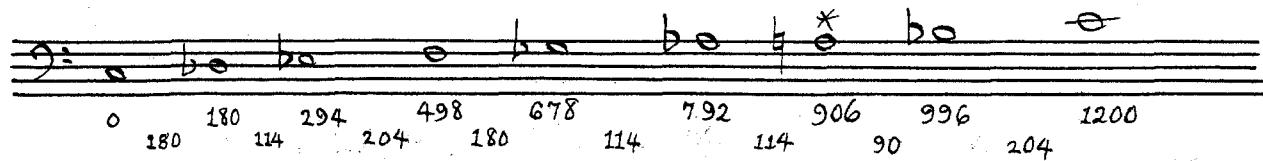
and as a tone forming with the sixth degree of this maqam the interval of an augmented second of 294 cents:



The maqam Isfahan was given two forms by Djami: the first with bakiye (1176 cents) between the seventh and eighth degrees:

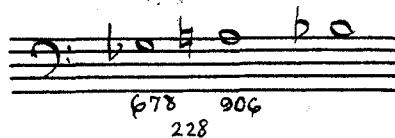


and the second form with bakiye (906 cents) between the sixth and seventh degrees:



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Including bakiye in the formation of the first kind of maqam Isfahan between the seventh and eighth degrees enriches this maqam with the possibility that is also found in the corresponding inclusion of bakiye in Maqam Iraq. The insertion of bakiye into the second kind of this maqam between the sixth and seventh degrees may lead either to the obtaining of an interval of 228 cents (enlarged second, a comma larger than the large whole-tone)



or to the interval of a large whole-tone of 204 cents:

